

REMARKS

This amendment is responsive to the Official Action dated December 21, 2005. In the amendment, claims 1, 2, 3, 5 and 6 have been amended and claims 1-11 and 18-26 remain pending in the application. These amendments add no new matter. Reconsideration of the pending claims in light of this amendment and the following remarks is respectfully requested.

Claims 1-6, 9-11, 18-21, 23 and 25 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Pat. No. 6,502,205 to Yanai ("Yanai") in view of U.S. Pat. No. 6,260,125 to McDowell ("McDowell"). This rejection is traversed.

Claim 1 recites: *[a] system for mirroring write operations from a local storage system onto a remote storage system, the system comprising:*

an asynchronous mirroring driver resident in the local storage system for intercepting I/O transactions to a storage disk of the local storage system, identifying a series of write transactions issued to said storage disk, making an exact copy of the series of write transactions, and storing said exact copy within a series of files that are created on a file-system of the local storage system; and

a first asynchronous mirroring coordinator resident on the local storage system for invoking a file transfer system to transmit the series of files on the local file-system of the local storage system to a file system of the remote storage system via a non-proprietary network protocol to accommodate an exact reproduction at the remote storage system of the series of write transactions as issued to said storage disk of the local storage system.

Applicant's claimed invention provides mirrored storage by intercepting I/O transactions to a storage disk of a local storage system, and retaining an exact copy of the corresponding write transactions within a series of regular file system files. These files are then transmitted to a remote storage system via a non-proprietary network protocol, and an exact reproduction of the write transactions may be carried out at the remote storage system.

These claimed features provide several advantages not believed to be present in conventional systems. Retaining an exact record of write transactions allows a return to any

point on a per-transaction basis in the event of failure on either the local or remote storage side. The overhead of managing a local buffer and corresponding with the remote system in response to regular write transactions is also avoided. Finally, implementation of file system files and non-proprietary network communication protocols (*e.g.*, IP and/or FTP) introduces flexibility and resiliency to the system.

These claimed features are neither disclosed nor suggested by Yanai, which discloses a mirroring system that implements dedicated disk adapters and a high speed proprietary communications protocol to seek provision of high bandwidth mirroring of data. Yanai offers no disclosure or suggestion of (1) storing an exact copy of the series of write transactions ... *to accommodate an exact reproduction* of the same at the remote storage system; (2) retaining the exact copy of the write transactions *within a series of file system files*; or (3) using *a non-proprietary network protocol* to transmit such files to the remote storage system.

The Examiner acknowledges that the first feature described above is absent from Yanai, and introduces McDowell to attempt to remedy this deficiency. (Office Action, p. 3). Applicant also notes the Yanai fails to disclose or suggest retaining the exact copy of the write transactions within a series of file system files, or using a non-proprietary network protocol to transmit the series of files to the remote storage system, as claimed by Applicant.

Regardless, McDowell does not remedy the deficiencies of Yanai. McDowell discloses an asynchronous disk mirroring system. The McDowell system implements a write queue that provides a FIFO buffer containing write requests that are individually sent to the remote storage device. If the queue hits a “high water mark” then further transactions are blocked until writes to the remote system have been completed. (McDowell, 5:11-20). During a blockage, queued write transactions are written to a log file.

Although it is unclear which feature of McDowell is contended by the Examiner to disclose Applicant’s claimed invention, it is submitted that neither the write queue nor the log file of McDowell offers any disclosure or suggestion in that regard.

The write queue of McDowell is merely a conventional FIFO buffer that passes the write transactions to the remote system. While it may contain a sequential series of write transactions, these write transactions are in no way stored within a series of file system files of the local system, as claimed by Applicant. Rather, as stated in McDowell, “[w]rite transactions received

from the write queue by the transaction manager ... are directed over the network to the secondary mirrored volume.” (McDowell, at 4:65-67). At best, there is an individual passage of some write transactions from the local system to the remote system. There is no retention or storage of the exact copy of the series of write transactions within a series of file system files, as claimed by Applicant.

The log file also clearly fails to disclose or suggest these claimed features of Applicant’s invention. As the Examiner acknowledges, Yanai does not disclose retention of the exact copy of the series of write transactions to accommodate an exact reproduction of the write transactions at the remote system. The log file of McDowell is merely another example (like Yanai) of a system that seeks to “optimize” mirroring by consolidating write transactions in some fashion, and therefore also offers no disclosure or suggestion of the exact retention and remote reproduction of the write transactions, as claimed by Applicant. Indeed, McDowell explicitly discloses that both the write queue and the log file are operated to avoid full retention of the transaction record. As McDowell states:

“In order to optimize the queuing process for write locality, i.e., minimizing duplicate writes, each queued write transaction contained on a linked list for FIFO writes is also associated with a hash chain based upon the block being written. The queuing algorithm on the writer simply enqueues each new transaction normally into the transmit queue, then walks the hash chain for the given block to see if the new transaction supersedes a transaction that's already queued. If it does, then that item is replaced, otherwise the new transaction is inserted onto the end of the hash chain. The same algorithm can be extended to work on log files ...”

(McDowell, at 5:56-67).

Clearly, the minimization of duplicates and corresponding hash chain manipulation does not disclose or suggest, and actually teaches away from Applicant’s claimed invention, wherein the exact copy of the series of write transactions is retained and exact reproduction of the same is accommodated at the remote system. Moreover, there is clearly no disclosure or suggestion of storing the write transactions within a series of file system files, or of transmitting such files to the remote system using a non-proprietary network protocol, all features recited in claim 1.

Since Yanai and McDowell, whether alone or in any combination, would still fail to yield the claimed invention, Applicant submits that a prima facie case of obviousness has not been presented for independent claim 1.

For reasons similar to those provided regarding claim 1 above, Yanai and McDowell also fail to disclose or suggest the features recited in independent claims 3 and 5. Dependent claims 2, 4, 6, 9-11 and 18-26 incorporate the features of their respective independent claims and thus are also neither disclosed nor suggested by the relied-upon references. They also separately recite additional distinct features, which have already been made of record, and which need not be reproduced herein.

Accordingly, Applicant respectfully requests reconsideration and withdrawal of the rejection of the noted claims under 35 U.S.C. § 103(a) as being unpatentable over Yanai in view of McDowell.

Claims 7 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Yanai in view McDowell, and further in view of U.S. Patent No. 5,673,382 to Cannon et al. ("Cannon"); and claim 8 has been rejected as being unpatentable over Yanai, McDowell, and Cannon, and further in view of U.S. Patent No. 5,713,014 to Durflinger et al. ("Durflinger"). These rejections are respectfully traversed.

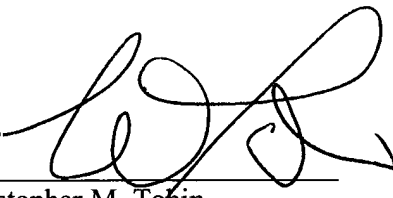
Claims 7 and 8 incorporate the features of claim 1 described as being absent from Yanai and McDowell. Durflinger and Cannon clearly do not remedy the deficiencies of Yanai and McDowell. Particularly, these (third and fourth) relied upon references fail to disclose or suggest retention of the exact copy of the series of write transactions, doing such in a series of file system based files, non-proprietary transmission of the series of files to the remote system, and exact reproduction of the series of write transactions on the remote storage system, all as claimed by Applicant.

Moreover, claims 7 and 8 add features found in the previously described file system files. Since even the basic elements of such files are not found in the cited references, clearly there is also a failure to disclose the particulars recited in claims 7 and 8. Cannon appears to describe locating a file by noting its offset within a storage volume. (Cannon, 8:41-46). This does not disclose the presentation of a write transaction in a file, and corresponding inclusion of the size of the file itself, or offset information as claimed. Durflinger discloses a database management system that uses pointers to locate data positions within files. Usage of pointers for database management is clearly in a different context, and markedly different from Applicant's claimed invention.

Finally, Applicant notes that a proper motivation to combine the various relied upon references has not been made of record, which also supports a conclusion that a prima facie case of obviousness has not been presented by the Examiner.

Accordingly, Applicant requests reconsideration and withdrawal of the rejection of claims 7-8 under 35 U.S.C. § 103.

For the foregoing reasons, reconsideration and allowance of the claims which remain in the application are solicited. If any further issues remain, the Examiner is invited to telephone the undersigned to resolve them.


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